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Short Communication

Stuck in between: First case of transverse intersexuality in *Trochosa cachetiensis* Mcheidze, 1997 (Araneae, Lycosidae) from Georgia

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Abstract

The first illustrated description of transverse intersexuality in *Trochosa cachetiensis* Mcheidze, 1997, from Georgia, is provided. In this specimen, both male (palpal bulbs) and female (epigyne) structures are underdeveloped. Brief comparison of the intersex specimen with normally developed conspecifics is given.

Key words: development, intersexes, sexual abnormalities, wolf spider

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Introduction

Gynandromorphy and intersexuality are rare developmental anomalies reported from several arthropod groups, but are only infrequently observed in arachnids. According to different estimations, the frequency is at roughly one case per 5000–17000 in spiders (Karston 1961; Stratton 1995). By contrast, only a handful of cases have been reported from other arachnid orders, including harvestmen (Opiliones), scorpions (Scorpiones), camel spiders (Solifugae) (Cokendolpher 1988), and ticks and mites (Acariformes and Parasitiformes) (Narita et al. 2010). These abnormalities are generally recorded during faunistic studies, though occasional cases have been observed in captive specimens (Laborda and Pérez-Miles 2017; Sherwood 2020).

The origins of gynandromorphy and intersexuality in spiders have been linked to diverse factors, ranging from internal parasites (Holm 1941) and endocrine or chromosomal irregularities (Roberts and Parker 1973; Palmgren 1979) to, more recently, genetic mechanisms (Narita et al. 2010). However, the distinction between gynandromorphy and intersexuality has not always been applied consistently across the literature (Roberts and Parker 1973; Bednarz and Czajka 1975; Wunderlich 1995). In an attempt to bring order to this variation, Roberts and Parker (1973) proposed the first classification of sexual anomalies in spiders, grouping them into 14 morphological types. These types, though partly arbitrary, were recognized as subdivisions of three basic patterns – lateral, transverse, and quartered combinations – some of which can be extremely difficult to detect externally. According to the authors, gynandromorphs possess

normally developed characters of at least one sex, whereas in intersexes these characters are either undeveloped or intermediate; however, both cases might be present in the same specimen. This concept has generally been adopted in most subsequent studies.

The earliest known report of such phenomena in spiders dates back to Blackwall (1867), who described a bilateral gynandromorph of *Crossopriza lyoni* (Blackwall, 1867) (as *Pholcus lyoni*) "in which the two sexes were united". Further cases have since been reported across different families and regions (Falconer 1910; Hull 1911, 1918; Spassky 1914; Bonnet 1934; Exline 1938; Denis 1947, 1949; Hackman 1952; Knülle 1954; Wiebes 1959; Kaston 1961; Andersons 1961; Yaginuma and Arita 1966; Mcheidze 1967; Mackie 1969; Waaler 1970; Nishikawa 1971; Tanaka 1971; Vasiliu 1971; Baert 1975; Bednarz and Czajka 1975; Gack and von Helversen 1976; Assmuth 1983; Galiano 1987; Kumada 1989; Maekawa and Ikeda 1992; Vanuytven 1995; Wunderlich 1995; Wright 1995; Krumpalova 1999; Gnelitsa 2005; Simó et al. 2006; Ponomarev and Kovblyuk 2009; Baba et al. 2016; Suzuki et al. 2019; Nadolny et al. 2022; Kunsete et al. 2025; Sherwood et al. 2025). Among these, Mcheidze (1967) provided the first record of spider gynandromorphy from Georgia, while the studies by Maekawa and Ikeda (1992) and Suzuki et al. (2019) stand out for their behavioural observations of gynandromorphic jumping spiders (Salticidae).

During fieldwork conducted at the beginning of September 2025 near Tbilisi (Telovani), three adult specimens of *Trochosa cachetiensis* Mcheidze, 1997 (Lycosidae) – initially assumed as two males and one female – were collected from the bank of a stream. However, a later microscopic examination revealed that one "male" was a transverse intersexual, exhibiting underdeveloped palpal bulbs and epigyne. To the best of my knowledge, this is the eighteenth lycosid species in which such sexual abnormalities have been reported, the second species from the genus *Trochosa* C. L. Koch, 1847 with sexual abnormalities, and the first intersexual spider from Georgia. Previous cases of intersexuality or gynandromophy among lycosid spiders were reported in *Arctosa tbilisiensis* Mcheidze, 1946, *Pardosa lapponica* (Thorell, 1872), *P. proxima* (C. L. Koch, 1847), *Piratula latitans* (Blackwall, 1841) (all Nadolny et al. 2022), *Alopecosa pulverulenta* (Clerck, 1757) (Gack and von Helversen 1976), *Hogna angusta* (Tullgren, 1901), *H. lenta* (Hentz, 1844) (both Kaston 1961), *Pardosa amentata* (Clerck, 1757), *P. palustris* (Linnaeus, 1758), *P. pullata* (Clerck, 1757), *P. sphagnicola* (Dahl, 1908) (all Holm 1941), *P. hortensis* (Thorell, 1872), *Alopecosa barbipes* (Sundevall, 1833) (both Roberts and Parker 1973), *P. monticola* (Clerck, 1757) (Mackie 1969), *P. sternalis* (Thorell, 1877) (Exline 1938), *Schizocosa ocreata* (Hentz, 1844) (Stratton 1995), and *Trochosa terricola* Thorell, 1856 (Wiebes 1959).

Material and methods

The examined material was collected individually under the rocks and logs at the stream bank. Collected specimens were preserved in 96% ethanol and stored in a freezer at -22 ˚C at the scientific collections of Ilia State University (Georgia, Tbilisi). Sampling details are given below. The elevations and GPS coordinates (given in WGS84) were obtained via Garmin GPS MAP 64s.
Spiders were identified and measured under a Zeiss Stemi 508 Stereo Microscope with 8:1 Zoom and a Zeiss Apo 1.5x FWD 53 mm front lens. For identifi-

cation, I used the diagnosis provided in Ponomarev et al. (2017) and Otto and Japoshvili (2018). Live and preserved specimens were photographed using a Canon EOS 90D camera paired with a Canon EF 60 mm f/2.8 Macro USM lens and a Canon Macro Twin Lite MT-26EX-RT flash system. Digital images were stacked using Zerene Stacker image stacking software and then processed in Adobe Photoshop CS6 (version 13.0). Photos of the genitalia were taken using an OMAX 40X-2000X Binocular Compound Biological Microscope equipped with an AmScope MU Series 18.0MP USB 3.0 Color CMOS C-Mount Microscope Camera. Digital images were processed in the same way as those of live and preserved spiders.

Results and discussion

Genus *Trochosa* C. L. Koch, 1847

Type species. *Aranea ruricola* De Geer, 1778

Trochosa cachetiensis Mcheidze, 1997

Figs 1–11

Trochosa cachetiensis: Ponomarev et al. 2017: 165, figs 10–15 (♂♀).
Trochosa cachetiensis: Otto and Japoshvili 2018: 382, figs 39–41, 48, 52–55 (♂♀).

Material examined. GEORGIA – Tbilisi • 1♀,1⚥,1♂; Tbilisi, Telovani Village; 41.8015°N, 44.6775°E; 925 m a.s.l.; deciduous forest, under rocks and logs at the stream bank; leg. A. Seropian; 1 Sep. 2025; CaBOL-IDs 1039469, 1039470, 1039475.

The intersexual specimen was assigned to *T. cachetiensis* based on the presence of conspecific adult males and females collected on the same day from the same population. The examination of this specimen revealed the presence of an underdeveloped pair of bulbs and the epigyne (Figs 3–4, 7–9). By an overall habitus, body length (Table 1), thick legs, presence of a short, dark, and broad fovea (cf. Fig. 3 and Fig. 1), the intersexual *T. chachetiensis* falls into the female category; however, the carapace ornamentation (the thin light irregular and anteriorly interrupted margin in particular) corresponds more to that of the males (cf. Fig. 3 and Fig. 11; Otto and Japoshvili 2018: fig. 39). There are no differences in the carapace length-width ratios of males and females examined in the present study and those given in the previous research, as all values fall within the same range (see Table 1). Both pedipalps have laterally depressed femur and patella (Fig. 3); cymbium yellow (vs. brown in males) (cf. Fig. 4, 9 and Fig. 11), with a distally located thin slit replacing a normally developed alveolus on the ventral side. Within this slit, malformed structures resembling the embolus, median apophysis, and tegulum are visible. The epigyne is ca. 2.8× smaller in height than fully developed, less sclerotized, with an anteriorly reduced median septum (lacking septal stem) and epigynal hoods (cf. Fig. 5 and Fig. 7). Unlike the fully developed female, the intersexual completely lacked the endogyne (cf. Fig. 6 and Fig. 8).

Thus, in terms of size, the specimen more closely resembles females of *T. cachetiensis* than males (Table 1). However, the carapace pattern and the

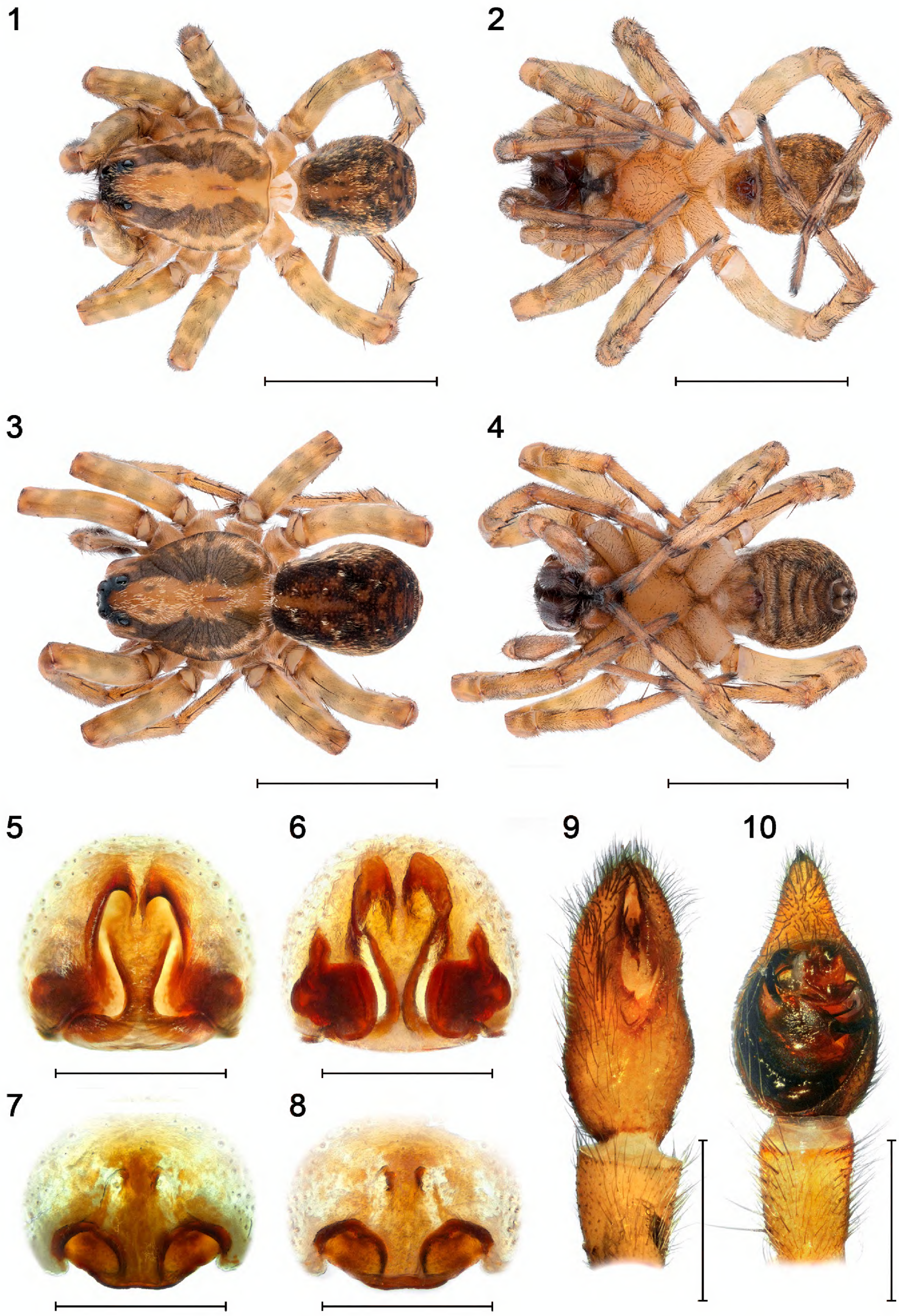

Figure 1–10. *Trochosa cachetiensis* (**1**: preserved female, dorsal view; **2**: ditto, ventral view; **3**: preserved transverse intersexual, dorsal view; **4**: idem, ventral view; **5**: normally developed epigyne, ventral view; **6**: normally developed endogyne, dorsal view; **7**: epigyne of the transverse intersexual, ventral view; **8**: ditto, dorsal view; **9**: palp of the transverse intersexual, ventral view; **10**: normally developed male palp, ventral view). Scale bars: 5 mm (1–4); 0.5 mm (5–8); 1 mm (9–10).

Figure 11. *Trochosa cachetiensis*, live adult male. Not for scale.

Table 1. Carapace length-width ratios and body length measurements of Trochosa cachetiensis.

Sex	Carapace length-width ratio	Body length	Reference
Male	1.29	8.6	Present study
Male	1.33	8.6	Otto and Japoshvili 2018
Male	1.34	8.2	Otto and Japoshvili 2018
Female	1.34	11.8	Present study
Female	1.31	12.61	Otto and Japoshvili 2018
Female	1.58	—	Mcheidze 1997
Intersex	1.29	11.7	Present study

presence of a pair of underdeveloped bulbs align it with males. It would have been particularly valuable to investigate the specimen's behavioural traits to determine how it functionally identified, but this was not possible as its abnormal morphology was noticed after preservation. Following the classification of Roberts and Parker (1973), the specimen is best regarded as a transverse regular intersexual. It is also noteworthy that sexual abnormalities have been documented in other congeners, such as the gynandromorph *T. terricola* Thorell, 1856 from the Netherlands (Wiebes 1959).

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Additional information

Conflict of interest

The authors has declared that no competing interests exist.

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Author contributions

Conceptualization, writing, material collection, analysis, visualization, data curation (A.S).

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Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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